

Fine Grained Tungsten Claddings for Cermet Based NTP Systems, Phase I

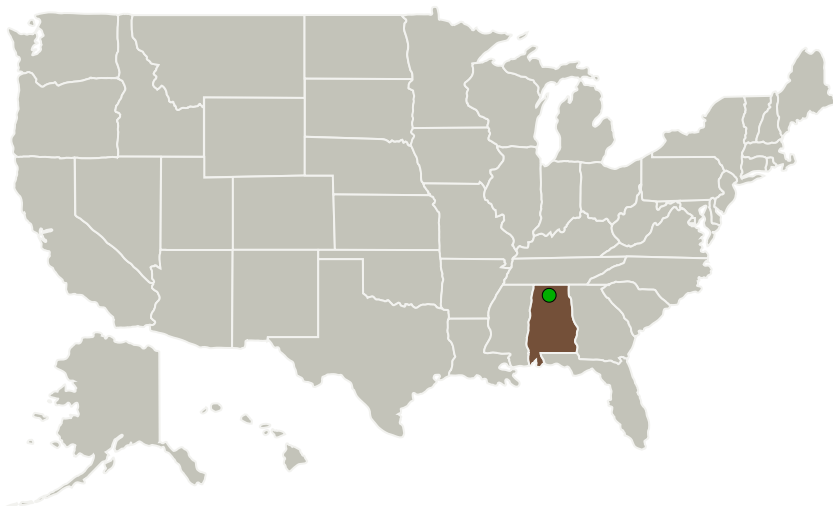
Completed Technology Project (2013 - 2013)



Project Introduction

In October 2011, NASA initiated the Nuclear Cryogenic Propulsion Stage (NCPS) program to evaluate the feasibility and affordability of Nuclear Thermal Propulsion (NTP). A critical aspect of the program is to develop a robust, stable nuclear fuel. One of the nuclear fuel configurations currently being evaluated is a cermet-based material comprised of uranium dioxide particles encased in a tungsten matrix. To prevent excessive fuel loss from reaction with the hot hydrogen gas passing through the cooling channels, both the internal surfaces of the cooling channels and the exterior of the fuel element must be clad with a hydrogen compatible material such as tungsten. To reduce the potential for uranium hydride formation that can lead to grain boundary separation and cracking, the diffusion of hydrogen into the cermet must be minimized. Therefore, fine-grained tungsten claddings are needed. Recently, advanced electrochemical processing techniques (EL-Form[®]) have been developed that enable the tailoring of refractory metal microstructures through process parameter manipulation and/or alloy additions. Therefore, these innovative electrochemical forming techniques will be used to produce fine-grained, hermetic tungsten claddings for both the internal and external surfaces of cermet based nuclear fuel elements.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
● Marshall Space Flight Center (MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	1
Project Transitions	2
Images	2
Technology Maturity (TRL)	2
Technology Areas	2
Target Destinations	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Scott O'dell

Fine Grained Tungsten Claddings for Cermet Based NTP Systems, Phase I


Completed Technology Project (2013 - 2013)



Primary U.S. Work Locations

Alabama

Project Transitions

 **May 2013:** Project Start

 **November 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140393>)

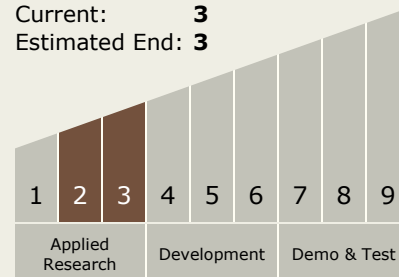
Images

Project Image

Fine Grained Tungsten Claddings for Cermet Based NTP Systems
(<https://techport.nasa.gov/image/126810>)

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX01 Propulsion Systems
 - TX01.4 Advanced Propulsion
 - TX01.4.3 Nuclear Thermal Propulsion

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System